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VOWELS IN GADANGME: A SPECTROGRAPHIC STUDY.

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[ata: na: ɲɔŋmɔ ajɔ: ɲɛ fɛ:]

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DEDICATION

I dedicate this work to L., M., and M. Doku.

ABSTRACT

This research is a spectrographic study of the 12 vowel phonemes of the Ga and Dangme languages with the aim of providing a systematic description of the vowel phonemes of these two languages. The result of the study reveals that Ga and Dangme basically have the same vowel sounds, comprising of 7 orals and 5 nasalized vowels. The most interesting result is that contrary to traditional views that the low vowel found in Ga and Dangme is the front vowel /a/, it is actually a back one which could be represented by the IPA symbol /ɑ/. The results further indicate that /ɔ̃/ is the furthest of the back vowels.

This thesis is made up of five main chapters. The first chapter, which is the introductory chapter, gives the aim of the study and describes the Ga and Dangme people. The locations of the Ga and Dangme speaking people have been described in this chapter. The vowel systems of both languages as described by the literature are described in this chapter. The problems associated with impressionistic descriptions of the vowel sounds together with cross linguistic implications of labels have been discussed as well. The second chapter discusses the trends in vowel quality research. The chapter is made up of two sections which talk about early studies and modern trends in the vowel quality research. Chapter three gives a vivid description of the methods used for data collection and analysis procedures. Chapter four gives the results of the analysis together with the results of statistical analysis. Chapter five discusses the findings of the research and then the conclusion.

"A good description of a language describes not only the phonological patterns within the language but also how the sounds may be characterized in terms of some absolute phonetic standards" Ladefoged 1978.

CHAPTER ONE: INTRODUCTION

This thesis aims to give a precise and systematic description of the quality of GaDangme vowels using spectrographic analysis. Thus it will help in identifying what makes the GaDangme vowels sound uniquely GaDangme as opposed to Akan, Ewe or English, for instance.

1.1 THE GADANGME PEOPLE:

The GaDangme people occupy all of the Greater Accra Region as well as the south-eastern part of the Eastern Region of Ghana. The Gulf of Guinea is the southern border of the GaDangme land. In the west, GaDangme land shares a boundary with the Fantis (Akan) of the Central Region of Ghana. To the north of GaDangme land are the Twis (Akan) of the Eastern Region of Ghana. The river Volta forms the eastern boundary which separates GaDangme land from the land of the Ewes of the Volta Region of Ghana. On the coast, GaDangme land stretches from Nyanyanu, at the western end, through Accra to Ada, the eastern-most town of the land. In other words, the GaDangme people are surrounded by Akans to the west and north and by Ewes to the east. (See Appendix 1 which presents a language map of Ghana.)

The Ga Language area is made up of the urban and suburban towns: Ga Mashie, Osu, La, Teshie, Nugua, Tema, Kpone, and their rural towns like Amasama, Pokuase, Samsam, Abokobi, Pantan, Ayi Mensah and Bawaleshie. Dangme land covers a vast area to the east of the Ga land. The Dangme language area starts from Ada at the Volta Estuary and includes the townships: Big Ada, Ningo, Prampram, Dodowa, Osuwem, Doryumu, Odumase (Krobo), Somanya, Asutsuare, Akuse, Kpong, and mountain settlements of Asesewa, Otrokpe, Oterkpolu, Madam, Kordiabe and Huhunya. (See Figure 1.1 for a map of GaDangme land.)

Historically, the Gadangme people are said to have migrated from the north eastern coast of Africa. They have shared one language and one culture. The GaDangme culture is so much like the Israelis of the Old Testament that myth has it that they actually migrated from Israel. In fact, a very popular Ga song of the first two years of the 21st Century highlights this mythological assumption with the pronouncements:

"Kɛjɛ Israel kɛba Egypt, kɛjɛ Ethiopia kɛba Sudan, Wɔgbɛ jɛkɛ, wɔjɛ ʃɔɔŋŋ . . ."
(From Israel to Egypt, from Ethiopia to Sudan, our path is far; we are from very far away . . .)

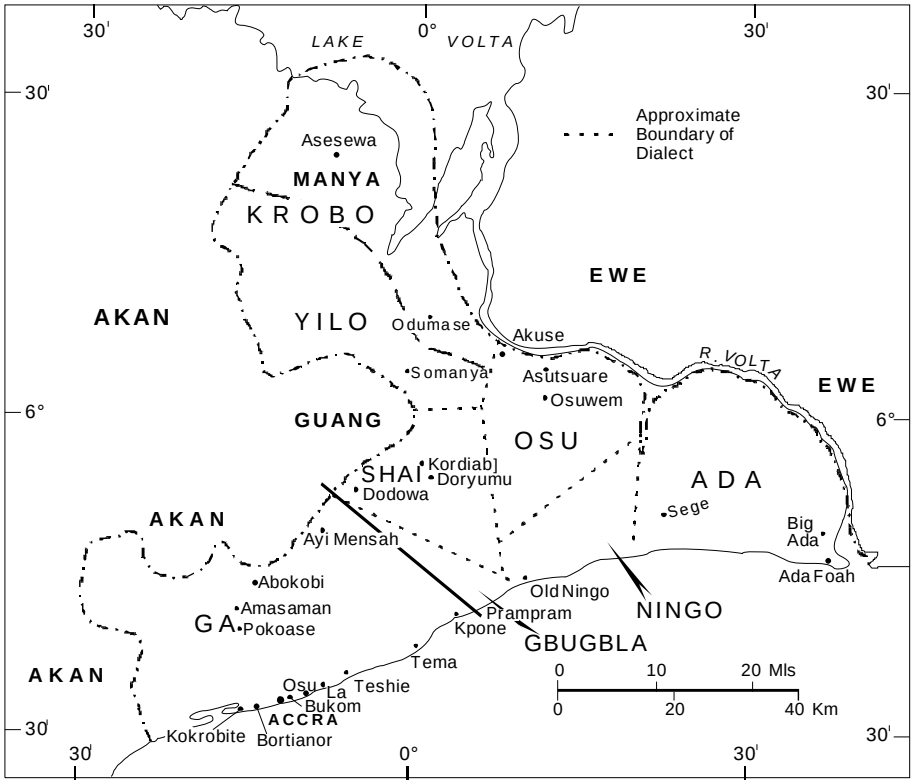

Figure 1.1: Map of GaDangme land.

Socio-politically, Ga and Dangme are currently viewed as two separate languages, though there is a move by the GaDangme Council headquartered in Accra to bring the two people (and languages) back together. The split between Ga and Dangme is believed to have occurred around 1300 AD. Dakubu (1987) indicates that GaDangme, made up of the Ga and Dangme people belongs to the Kwa section of the Niger-Congo family of languages. Williamson (1989), as cited by Wentum (1997), states that GaDangme is classified under the Nyo subgroup of New Kwa.

Depending on how one looks at the situation, Ga and Dangme could be viewed as dialects of one language – GaDangme. At the extreme ends of GaDangme land (i.e. the northern tip of the Krobo area and the coastal towns of the Ga area) the languages are about 50% level of intelligibility. But adjacent settlements on either side (e.g. Kpone on the Ga side and Prampram on the Dangme side) are mutually intelligible. This researcher does not have any views on the issue of whether or not Ga and Dangme are one language or two different languages. The result is that whenever appropriate, GaDangme is cited as one unit while at other times Ga and Dangme are referred to separately.

1.2 THE VOWEL SYSTEM OF GADANGME:

The GaDangme language has 12 vowel phonemes, 7 of which are oral vowels and 5 are nasalized vowels, Dakubu (2002) and Apronti (1967). There is meaning change in words when there is a change in the tone in GaDangme. Tone is therefore Phonemic in the GaDangme language. Ga contrasts two level tones: high tone and low tone and at least one contour tone while Dangme contrasts three level tones, namely, high, mid, and low tones. Eric Zee (1978) asserts that differences of high, low or mid tones affect the quality of vowels. This would mean that a complete inventory of GaDangme vowel sounds would have to include all 12 vowels in all three tonal environments – 36 vowels in all.

Some attempts have been made to provide phonetic descriptions of the vowel phonemes of GaDangme. But none of these descriptions of the vowel systems of GaDangme was based on any real scientific measurement. They are mostly impressionistic descriptions based on auditory perceptions. For instance, the traditional front/back and high/low description, corresponding to the highest tongue position in the mouth, have been used for a long time to classify the vowels. Thus, Dakubu (2002) presents the Ga vowel chart in the traditional triangle shown in Figure 1.2. Here, the nasalized vowels (curiously written with the tilde beneath them, the same way glottalization is symbolized) are presented as the higher members of the oral/nasalized pairs.

	Front Spread	Central Spread	Back Round
Close	ḭ i		ṵ u
Half-close	e		o
	ɛ̰		ɔ̰
Half-open	ɛ		ɔ
		a̰	
Open		a	

Figure 1.2: Ga Vowel Chart (as presented by Dakubu 2002).

Apronti (1967), in his University of London Ph.D. thesis, "A Phonetic and Phonological Study of the Nominal Piece in Dangme", presents the Dangme vowel chart with a slight difference, as shown in Figure 1.3. Comparing Figures 1.2 and 1.3, we notice some similarities as well as differences. For instance, as in Dakubu (2002), the nasalized vowels of Dangme are presented here as the higher members of the oral/nasalized pairs.

While the Dangme vowels seem to simply follow the "normal" vowel quadrilateral, the Ga nasalized vowels are presented as the more centralized of the cognate pairs. (The only exception to this is [ũ], which is shown as the furthest back of all Ga vowels.

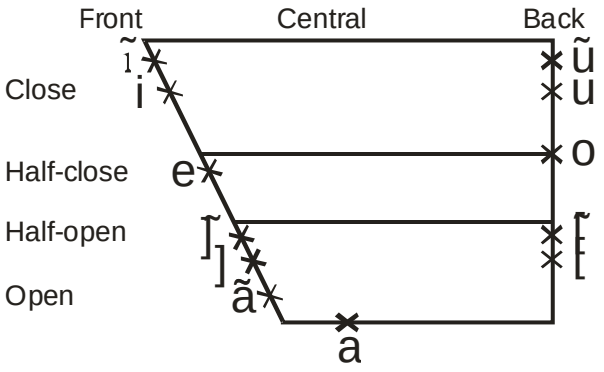

Figure 1.3: Dangme Vowel Chart (as presented by Apronti 1967)

1.3 THE PROBLEM OF IMPRESSIONISTIC LABELS:

In the traditional tongue height description of vowels, same symbols are used to represent "similar" vowel phonemes of different languages. The question arising is whether the sounds represented with same symbols, are the same in all languages. In other words, are impressionistic articulatory descriptions of phonemes enough to describe the distinctive features of the vowel phonemes of languages, including GaDangme?

Godinez (1978) notes that vowel quality has been traditionally described in terms of the tongue arching model which posits that the tongue height is of prime importance in the determination of vowel quality. He notes further that most people have depicted vowel qualities in the form of a triangular arrangement of points. The relative height of the points being a direct function of the tongue height required for a particular vowel quality. He suggests that vowel sounds be viewed as acoustically specifiable entities resulting from corresponding vocal tract configuration. He points out that constant vocal tract configurations result in particular vowel quality and that the acoustic signals generated by the vocal tract shapes result in a particular vowel quality perceived. He is of the view that these acoustic outputs can be measured by the use of the sound spectrograph (a device that translates a sound into visual representation of its component frequencies) for example.

Ladefoged (1993), notes that the traditional articulatory descriptions of vowels are not very satisfactory. He points out that, vowels called high do not have the same tongue height across languages and that the so-called back vowels vary considerably in their degree of backness. He maintains that the front/back and high/low dimension used to contrast vowels of languages are best described using acoustic terms. Referring to the

height of the tongue and the front/back description of vowels, Ladefoged, states that, "There is no doubt that these terms are appropriate for describing the relationships between different vowel qualities, but to some extent phoneticians may have been using these terms and labels to specify acoustic dimensions rather than as descriptions of actual tongue positions."

On the issue of the scientific testing of phonetic phenomena, Nartey (1982) states that, "There are several problems with the traditional descriptions in terms of place and manner of articulation parameters". He points out that difference in the shape of the tongue in the transverse plane can produce substantial acoustic differences between fricatives at the same place of articulation; hence the usual articulatory description is not precise enough. Ladefoged (1993) shares this view by indicating that articulatory descriptions must be backed by acoustic specifications in order to give precise and systematic descriptions of vowel phonemes of languages. He states further that the front/back, high/low specification of vowels disregard considerable differences in the shape of the tongue in front vowels and back vowels. Ladefoged is of the view that the labels high/low and front/back, for instance, should not be descriptions of tongue positions but simply, indications of the way one vowel sounds relative to another. The exact height of and frontness of the vowels of various languages cannot be measured precisely by the high/low, front/back articulatory parameters only.

Lindau (1977) gives features for the description of vowels of the languages of the world. She points out that vowel height and backness form the basis of a two dimensional vowel space required to describe vowels of nearly all languages. The two dimensional vowel space is described in terms of the highest point of the tongue. She goes on to state that the traditional highest point of the tongue is as good a measure of height and backness as the formant chart is. The height of the body of the tongue as well as its backness determines the quality of the vowel sounds just as the formant chart is able to show the height and backness and therefore the quality of the sound. Lindau came to a conclusion that the correlation between auditory measurements and acoustic measurements are fractionally higher than the correlations between the auditory measurements and articulatory measurements of height and frontness. Disner (1978), citing Ladefoged (1967) and (1975), states however that the very high correlation between auditory and articulatory measurements of height and backness which Lindau reports does not seem to carry over to certain other data sets and so the phonetic quality of a vowel can be expressed in terms of acoustic characteristics.

Jacobson, Fant, and Halle (1951), suggest that vowel features should be defined using combinations of articulation, acoustics, and perception so that features used in describing the vowel quality will be well defined. In other words, the frontness and backness of the tongue which are articulatory features may be used together with the acoustic features such as the formant frequency measures, and also the perception of the sound to describe the quality of the sound.

1.4 CROSS-LINGUISTIC IMPLICATION OF LABELS:

The sounds of languages which are usually transcribed with similar symbols are often taken to be the same sounds by teachers and learners of languages alike. This poses a lot of pronunciation and ultimately meaning problems when it comes to teaching and learning of languages. Disner (1978) states in, *Vowels in Germanic Languages*, that, "it may be hypothesized that some real differences hold between similarly transcribed vowels in different languages." She illustrates that even though vowels are transcribed with similar symbols across languages, differences exist in the perception of these vowels in different languages. For instance the vowel quality transcribed with the symbol /e/ may be higher in one language than in another while /i/ may be more front in one language than in another. Thus despite the fact that the vowels may appear to have the same qualities across languages they are not necessarily the same.

Ladefoged in 1964 and 1978 conducted research on the Phonetic differences within and between languages to show how sounds in one language differ from the sounds of other languages in order to be able to give good descriptions of languages. He pointed out, for instance, that the additional phonation type, murmur, is not phonetically the same in different languages. Among other things, he conducted spectrographic analysis of the murmur aspirated plosives in Owerri Igbo and Hindi. He also made spectrographic analysis of murmured nasals in Marathi and murmured vowels in Gujerati, as well as murmured stops in Javanese. He found out that murmured voiced stops in Owerri Igbo for instance, have more visible vibration than those of Hindi in which the vibration is less visible and the murmured release in Hindi lasts longer than that of Owerri Igbo. He also found that murmur in marathi may involve a different voice quality. Ladefoged came to the conclusion that what is called murmur in one language is not the same in another language. He stated further that phonology must not only account for the phonological facts of language, but also for the linguistic phonetic facts including phonetic differences between languages.

Chomsky and Halle (1968), reacting to Ladefoged's (1964) statement that the Ewe retroflex consonant "sounds slightly different from the retroflex stop found in Indian languages such as Hindi", state 'If this difference is systematic, it would clearly have to be reflected in the grammars of these languages. It is, however, quite sufficient to note that the point of contact between the tongue and the roof of the mouth is somewhat more advanced in one language than the other. This fact would presumably be reflected in low-level phonetic rules that assign numerical values to the different features. This existence of systematic phonetic differences does not, therefore, in itself constitute a necessary and sufficient condition for postulating an additional point of articulation.'

Nartey (1982) reacts to Chomsky and Halle's argument by stating that "If indeed we find a third language that uses this systematic difference between say, Hindi and Ewe retroflex stops as a distinctive feature, our phonological theory would not be adequately prepared to handle this hypothetical language. Also, as they recognize, there is a phonetic contrast which needs to be described." He notes that for instance, the phonetic feature that makes a Navaho ejective different from a Hausa ejective can potentially be used by a

third language as a distinctive feature, and so phoneticians are expected to fully describe such a difference. He quotes Ladefoged as saying: " – but if there is a noticeable difference between two sounds in different languages, such that either of them would sound foreign if it were used in the other language, then this difference is part of the linguistic facts of each language".

In view of the differences that occur in the quality of vowels in different languages there is the need for an adequate model to give precise and systematic description of the vowels of each language. Such a model will help phoneticians describe the sound patterns of various languages more adequately. A precise description of the vowels of a language will help in distinguishing that language from any other language and this will help teachers of the language to describe the vowels of the language more adequately and teach it comprehensively.

In search of answers for this situation, much work has been done in the area of acoustic analysis to characterize the phonetic differences that exist within and between languages. These include Skelton (1950), who did a spectrographic analysis of Spanish vowels and was able to characterize the vowel sounds of Spanish. Others include, Peterson and Barney (1952), who studied American English vowels; Fant, (1960), who studied Swedish vowels; Delattre (1964), who conducted a study in which he compared the phonetic features of English, French, German, and Spanish; Heike (1967), who compared the vowel qualities of Porto Alegre and Coimbra speech to characterize their vowels; Godinez (1978), who compared the vowel sounds of Mexican and Peninsular Spanish dialects as well as Brazilian Portuguese and came up with the differences that exist between the qualities of vowels in the different dialects. There have been, however, only a few attempts to do acoustic analysis of African languages much less the Ghanaian languages. The best known study of African languages, Peter Ladefoged's (1964) *A Phonetic Study of West African Languages*, focused more on consonants than vowels. The current research is an attempt to improve the situation by contributing to the scientific phonetic data on African languages – in this case the GaDangme languages.

In the next Chapter, I will take a closer look at some studies involving vowel quality in some natural languages of the world.